



## STC5NF20V

### N-CHANNEL 20V - 0.030 $\Omega$ - 5A TSSOP8 2.7V-DRIVE STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STC5NF20V	20 V	< 0.040 $\Omega$ ( @ 4.5 V ) < 0.045 $\Omega$ ( @ 2.7 V )	5 A

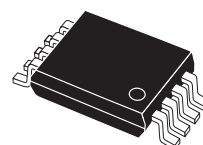
- TYPICAL R<sub>DS(on)</sub> = 0.030  $\Omega$  @ 4.5 V
- TYPICAL R<sub>DS(on)</sub> = 0.037  $\Omega$  @ 2.7 V
- ULTRA LOW THRESHOLD  
GATE DRIVE (2.7 V)
- STANDARD OUTLINE FOR EASY  
AUTOMATED SURFACE MOUNT ASSEMBLY

#### DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

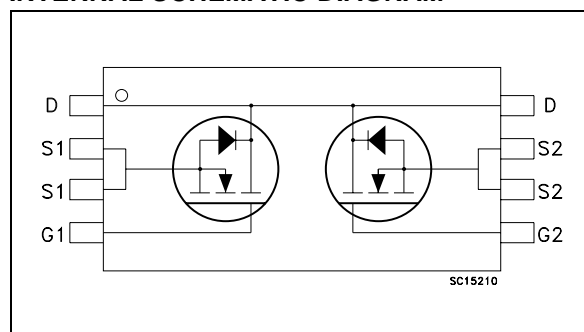
#### APPLICATIONS

- DC MOTOR DRIVE
- DC-DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN PORTABLE/DESKTOP PCs



TSSOP8

#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	20	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )	20	V
V <sub>GS</sub>	Gate- source Voltage	$\pm 12$	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	5	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	3	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	20	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	1.5	W

(●) Pulse width limited by safe operating area.

## STC5NF20V

### THERMAL DATA

Rthj-pcb	Thermal Resistance Junction-PCB (**)	Max	100	°C/W
Rthj-pcb	Thermal Resistance Junction-PCB (*)	Max	83.5	°C/W
T <sub>j</sub>	Operating Junction Temperature		-55 to 150	°C
T <sub>stg</sub>	Storage temperature		-55 to 150	°C

(\*) When Mounted on FR-4 board with 1 inch<sup>2</sup> pad, 2 oz of Cu and t ≤ 10 sec

(\*\*) When Mounted on minimum recommended footprint

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 µA, V <sub>GS</sub> = 0	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C			1 10	µA µA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 12V			±100	nA

#### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 µA	0.6			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 2.5 A V <sub>GS</sub> = 2.7 V I <sub>D</sub> = 2.5 A		0.030 0.037	0.040 0.045	Ω Ω

#### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> =15 V I <sub>D</sub> = 2.5 A		9.5		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 15V f = 1 MHz, V <sub>GS</sub> = 0		460 200 50		pF pF pF

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 10\text{ V}$ $I_D = 2.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1)		7 33		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 16\text{ V}$ $I_D = 5\text{ A}$ $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 2)		8.5 1.8 2.4	11.5	nC nC nC

**SWITCHING OFF**

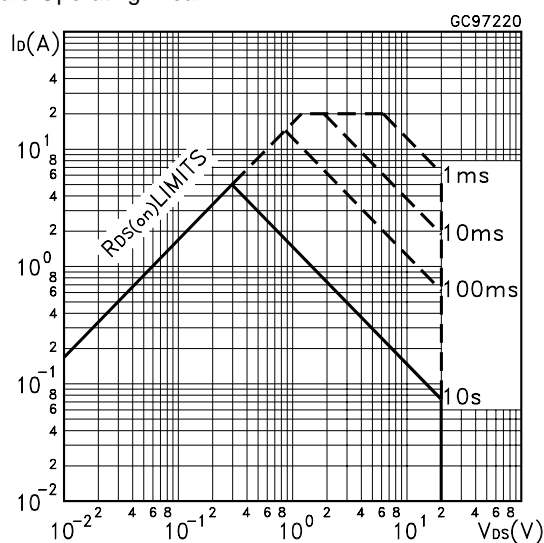
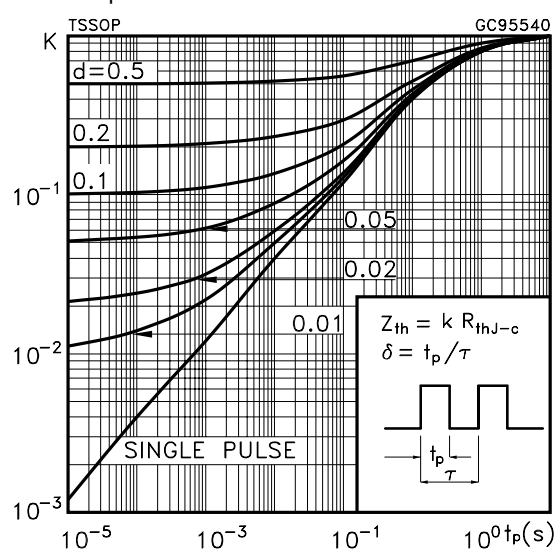
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 10\text{ V}$ $I_D = 2.5\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1)		27 10		ns ns
$t_{d(Voff)}$ $t_f$ $t_c$	Off-voltage Rise Time Fall Time Cross-over Time	$V_{clamp} = 16\text{ V}$ $I_D = 5\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (Inductive Load, Figure 3)		26 11 21		ns ns ns

**SOURCE DRAIN DIODE**

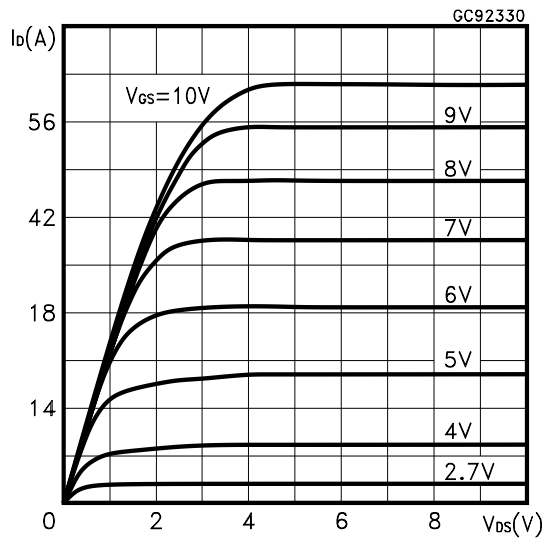
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				5 20	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 5\text{ A}$ $V_{GS} = 0$			1.2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 10\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 3)		26 13 1		ns nC A

( $\ast$ ) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

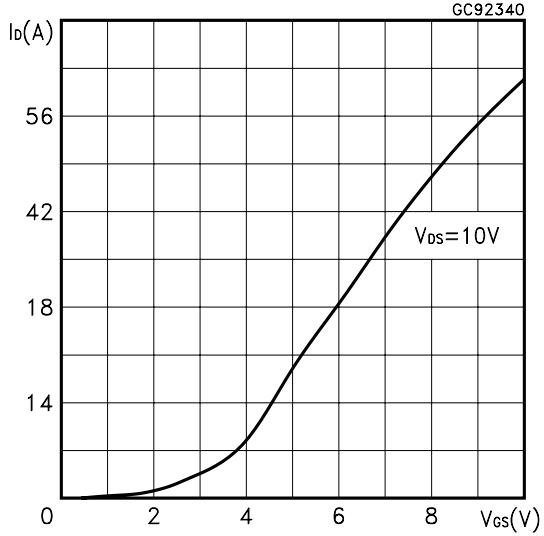
( $\bullet$ ) Pulse width limited by safe operating area.

**Safe Operating Area****Thermal Impedance**

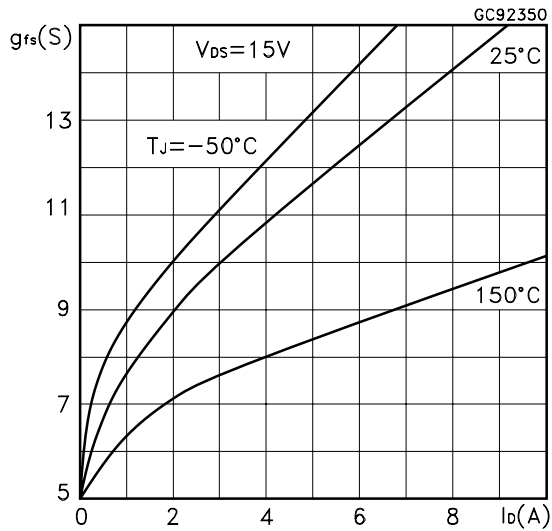
Output Characteristics



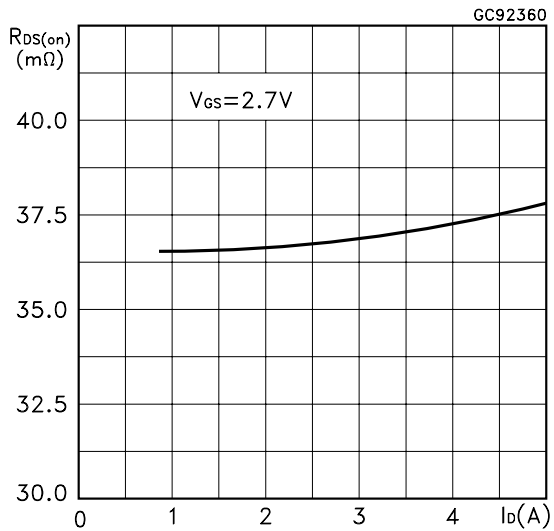
Transfer Characteristics



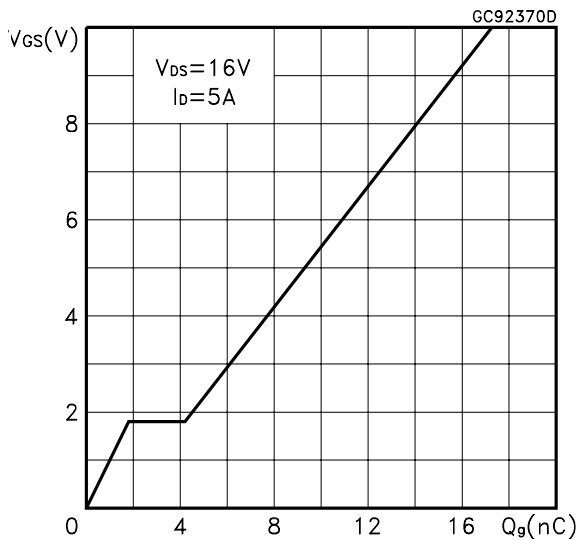
Transconductance



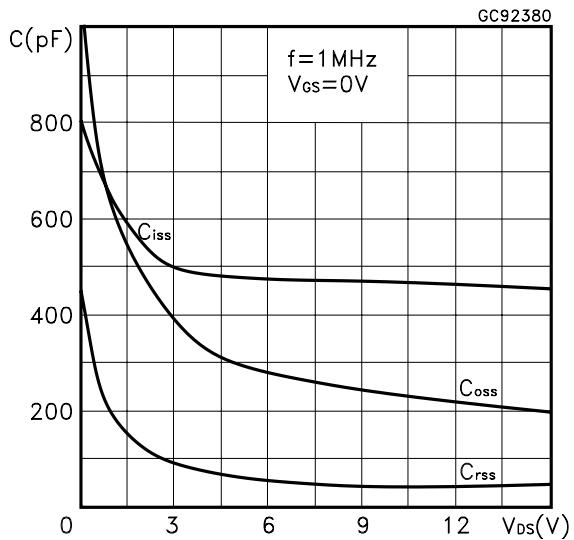
Static Drain-source On Resistance



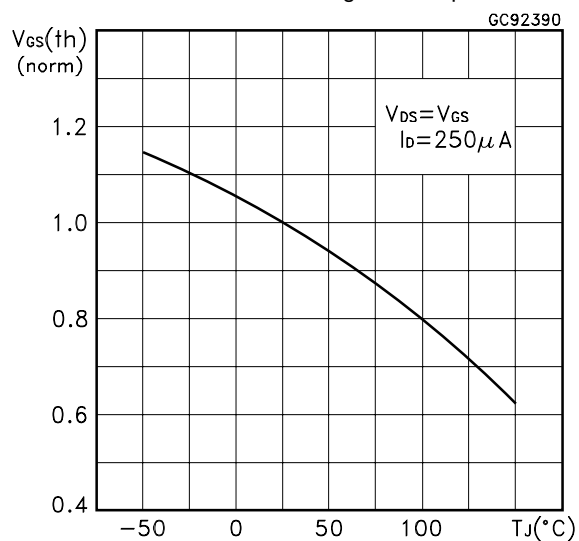
Gate Charge vs Gate-source Voltage



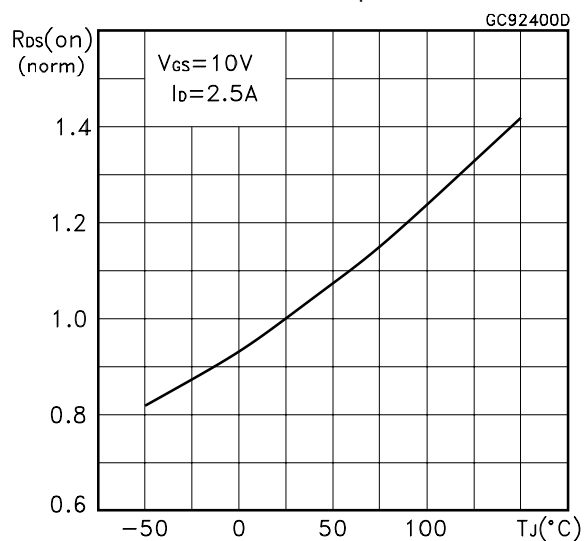
Capacitance Variations



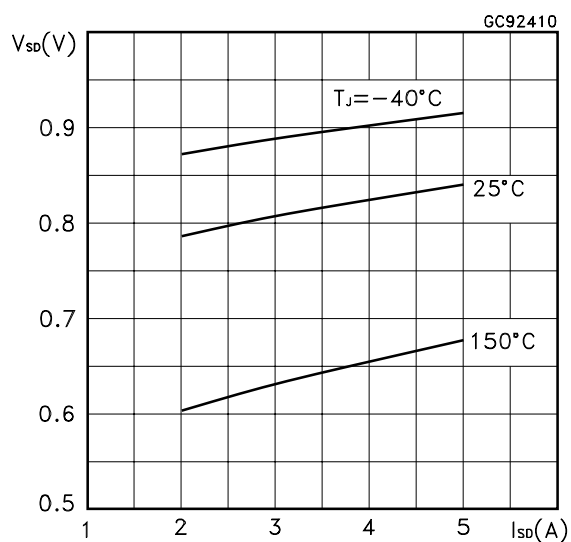
Normalized Gate Threshold Voltage vs Temperature



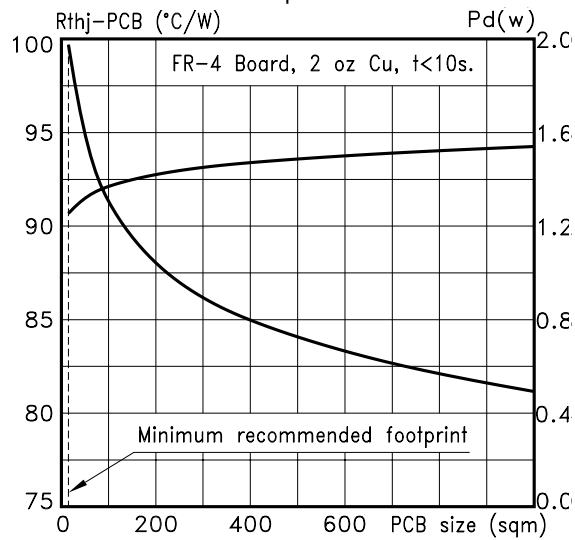
Normalized on Resistance vs Temperature



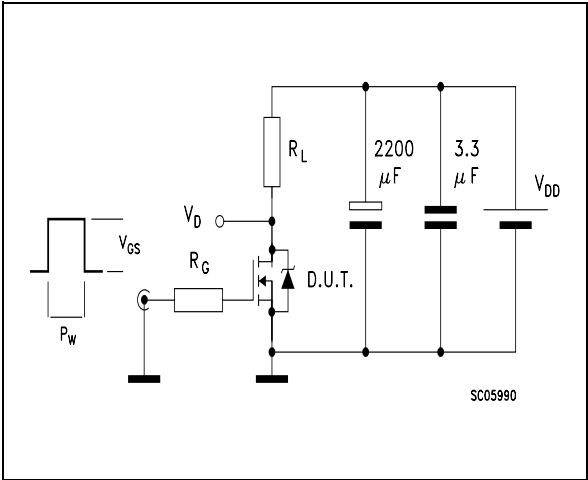
Source-drain Diode Forward Characteristics



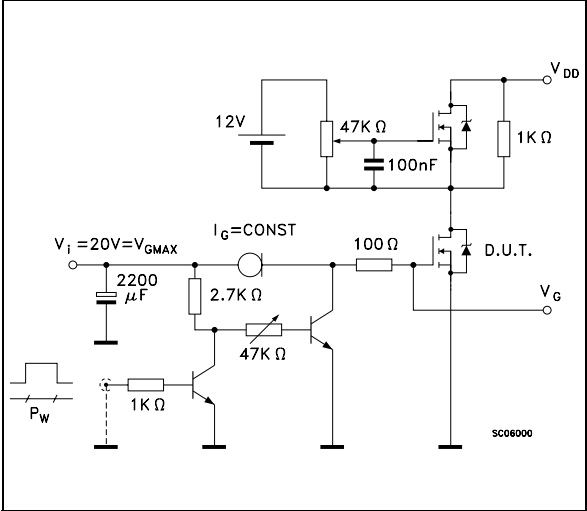
Thermal resistance and max power



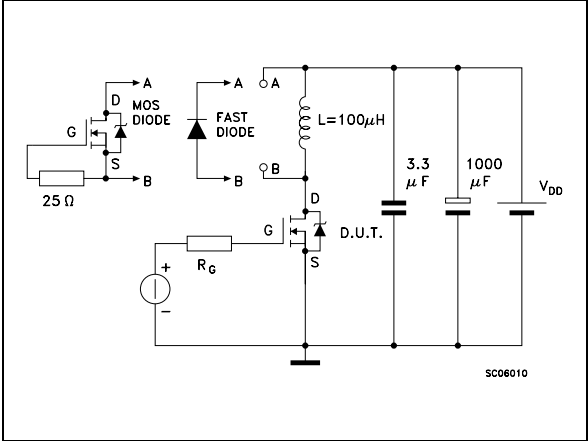
**Fig. 1: Switching Times Test Circuits For Resistive Load**



**Fig. 2: Gate Charge test Circuit**

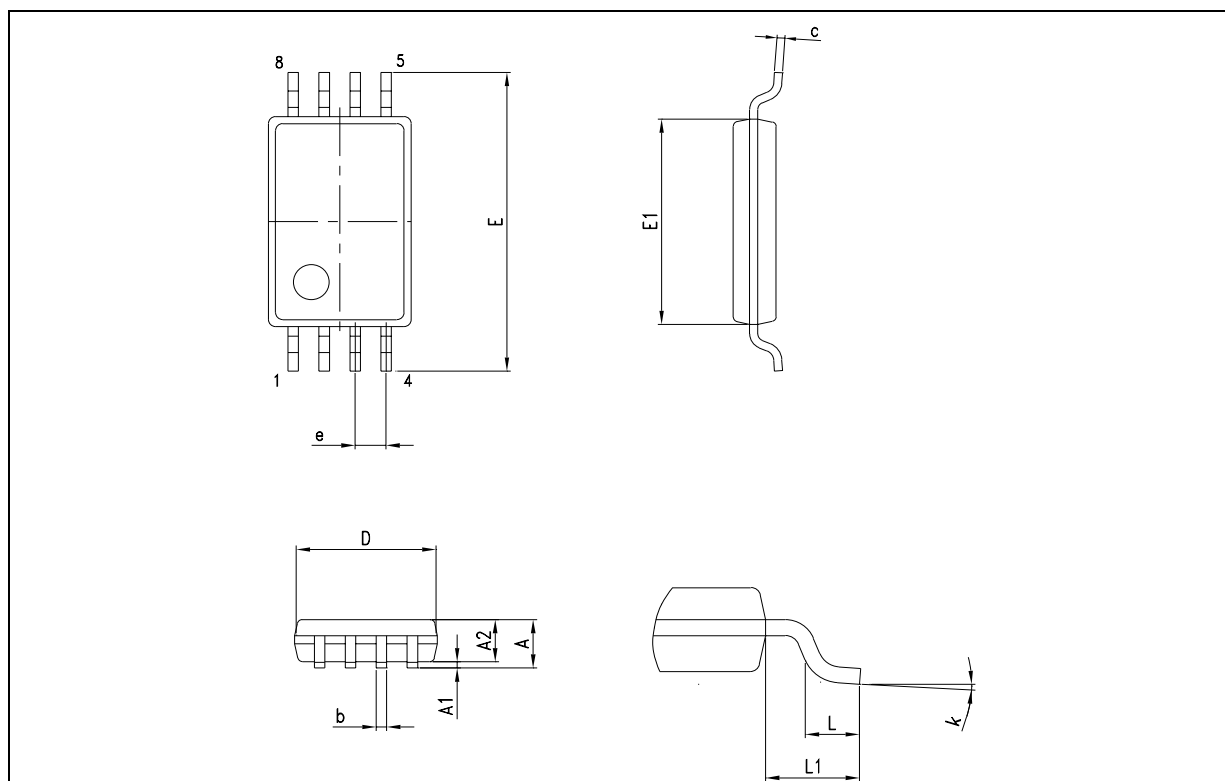


**Fig. 3: Test Circuit For Diode Recovery Behaviour**



## TSSOP8 MECHANICAL DATA

DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.05		1.20	0.041		0.047
A1	0.05		0.15	0.002		0.006
A2	0.80		1.05	0.032		0.041
b	0.19		0.30	0.008		0.012
c	0.090		0.20	0.003		0.007
D	2.90		3.10	0.114		0.122
E	6.20		6.60	0.240		0.260
E1	4.30		4.50	0.170		0.177
e		0.65			0.025	
L	0.45		0.75	0.018		0.030
L1		1.00			0.039	
k	0°		8°	0.192		0.208



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